We Claim:

1. An article comprising, in combination, a substrate, and a photochromic polyurethane coating on at least one surface of said substrate, said coating having a Fischer microhardness of from 50 to 150 Newtons per mm^2, wherein the improvement comprises preparing said photochromic polyurethane coating from components comprising:

(a) polycarbonate polyol(s) having a molecular weight of from 500 to 5,000 grams per mole;

(b) optionally, a different organic polyol having a molecular weight of at least 500 grams per mole;

(c) an isocyanate;

(d) photochromic compound(s); and

(e) optional catalyst;

said components being used in such proportions to produce a photochromic polyurethane coating exhibiting less than 25% swell in the Percent Swelling Test.

2. The article of claim 1 further comprising a protective hardcoat applied to the photochromic polyurethane coating.

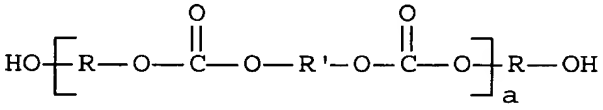
3. The article of claim 2 wherein the protective hardcoat is an organosilane hardcoat.

4. The article of claim 1 wherein said photochromic polyurethane coating exhibits a ΔOD of at least 0.15 after 30 seconds and at least 0.28 after 8 minutes, and a Bleach Rate of less than 70 seconds - all as measured in the 85°F Photochromic Performance Test.

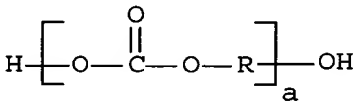
5. The article of claim 4 wherein the photochromic polyurethane coating exhibits 10% or less swell in the Percent Swelling Test.

6. The article of claim 1 wherein the polycarbonate polyol is represented by

(a) the following general formula I:



(b) the following general formula II:



or

(c) a combination of polycarbonate polyols represented by general formulae I and II wherein each R and R' independently represent divalent C_2-C_{10} aliphatic radicals or divalent C_6-C_{15} aromatic radicals and a is an integer selected from 3 to 15.

7. The article of claim 6 wherein the polycarbonate polyol represented by general formula I is formed by the reaction of a bis(chloroformate) and an organic polyol.

8. The article of claim 7 wherein the bis(chloroformate) is selected from monoethylene glycol bis(chloroformate), diethylene glycol bis(chloroformate), butanediol bis(chloroformate), hexanediol bis(chloroformate), neopentyldiol bis(chloroformate) bisphenol A bis(chloroformate) or mixtures of such bischloroformates.

9. The article of claim 7 wherein the organic polyol is selected from bisphenol A, trimethylolpropane, 1,3-propanediol, 1,4-butanediol, 1,5-pentanediol, 1,6-hexanediol, 1,7-heptanediol, 1,8 octanediol, 1,9-nonanediol; 1,10-decanediol; polyethylene glycol, polypropylene glycol, poly(oxytetramethylene)diol, polycaprolactone polyol or mixtures of such polyols.

10. The article of claim 1 wherein the different organic polyol (b) is selected from polyester polyols; polyether polyols, amide-containing polyols; polyacrylic polyols; epoxy polyols; polyhydric polyvinyl alcohols; urethane polyols and mixtures thereof.

11. The article of claim 10 wherein said polyacrylic polyol is a copolymer of hydroxy-functional ethylenically unsaturated monomers and other ethylenically unsaturated monomers selected from the group consisting of vinyl aromatic monomers, vinyl aliphatic monomers, alkyl esters of (meth)acrylic acids, epoxy-functional monomers, carboxy-functional monomers and mixtures of such ethylenically unsaturated monomers.

12. The article of claim 1 wherein said isocyanate component is a blocked or modified isocyanate.

13. The article of claim 12 wherein said isocyanate component is selected from the group consisting of aliphatic isocyanates, aromatic isocyanates, cycloaliphatic isocyanates, heterocyclic isocyanates and mixtures thereof.

14. The article of claim 13 wherein said isocyanate component is selected from the group consisting of hexamethylene-1,6-diisocyante, isophorone diisocyanate, ethylene diisocyanate, dodecane-1,12-diisocyanate, cyclohexane-1,3-diisocyanate and mixtures thereof.

15. The article of claim 14 wherein said isocyanate component is a blocked isocyanurate of isophorone diisocyanate.

16. The article of claim 15 wherein said blocked isocyanurate is blocked with a blocking compound selected from the group consisting of methanol, diisopropyl amine, 1,2,4-triazole, methyl ethyl ketoxime and mixtures thereof.

17. The article of claim 1 wherein said photochromic compound is selected from the group consisting of naphthopyrans, benzopyrans, phenanthropyrans, indenonaphthopyrans, spiro(benzindoline)naphthopyrans, spiro(indoline)benzopyrans, spiro(indoline)naphthopyrans, spiro(indoline)quinopyrans, spiro(indoline)pyrans, spiro(indoline)naphthoxazines, spiro(indoline)pyrido-benzoxazines, spiro(benzindoline)pyridobenzoxazines, spiro(benzindoline)naphthoxazines, spiro(indoline)-benzoxazines, mercury dithizonates, fulgides, fulgimides and mixtures of such photochromic compounds.

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18. The article of claim 1 wherein the catalyst is selected from 1,4-diazabicyclo[2.2.2]octane, dibutyl tin acetate, dibutyl tin dilaurate or mixtures thereof.

19. The article of claim 1 wherein a primer layer is interposed between the substrate and the photochromic polyurethane coating.

20. The article of claim 1 wherein said substrate is selected from the group consisting of paper, glass, ceramic, wood, masonry, textile, metal and organic polymeric materials.

21. The article of claim 20 wherein said organic polymeric material is selected from the group consisting of poly(C_1-C_{12} alkyl methacrylates), poly(oxyalkylene dimethacrylates), poly(alkoxylated phenol methacrylates), cellulose acetate, cellulose triacetate, cellulose acetate propionate, cellulose acetate butyrate, poly(vinyl acetate), poly(vinyl alcohol), poly(vinyl chloride), poly(vinylidene chloride), thermoplastic polycarbonates, polyesters, polyurethanes, polythiourethanes, poly(ethylene terephthalate), polystyrene, poly(alpha methylstyrene), copoly(styrene-methylmethacrylate), copoly(styrene-acrylonitrile), polyvinylbutyral and polymers of bis(allyl carbonate) monomers, polyfunctional acrylate monomers, polyfunctional methacrylate monomers, diethylene glycol dimethacrylate monomers, diisopropenyl benzene monomers, ethoxylated bisphenol A dimethacrylate monomers, ethylene glycol bismethacrylate monomers, poly(ethylene glycol) bismethacrylate monomers, ethoxylated phenol bis methacrylate monomers, alkoxylated polyhydric alcohol polyacrylate monomers, styrene monomers, urethane acrylate monomers, glycidyl acrylate monomers, glycidyl methacrylate monomers, and diallylidene pentaerythritol monomers.

22. The article of claim 21 wherein the organic polymeric material is a solid transparent polymer selected from the group consisting of poly(methyl methacrylate), poly(ethylene glycol bismethacrylate), poly(ethoxylated bisphenol A dimethacrylate), thermoplastic polycarbonate, poly(vinyl acetate), polyvinylbutyral, polyurethane, polythiourethane and polymers of diethylene glycol bis(allyl carbonate) monomers, diethylene glycol dimethacrylate monomers, ethoxylated phenol bis methacrylate monomers, diisopropenyl benzene monomers and ethoxylated trimethylol propane triacrylate monomers.

23. The article of claim 22 wherein said substrate is an optical element.

24. The article of claim 23 wherein said optical element is a lens.

25. The article of claim 24 wherein the refractive index of said lens is from 1.48 to 1.75.